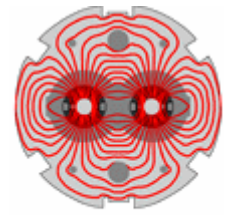


LHC Accelerator Requirements

Elvin Harms/FNAL
July 21, 2005



Requirements Review



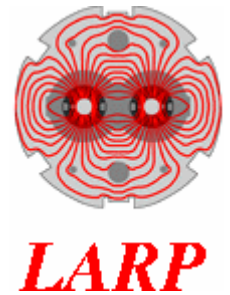
LARP

Schedule for the July 21 Review:

- 7:30 am Executive session
- 8:00 am Introduction to LHC@FNAL (Erik)
- 8:10 am CMS Detector Requirements (Patty)
- 8:50 am LHC Accelerator Requirements (Elvin)
- 9:30 am Executive session



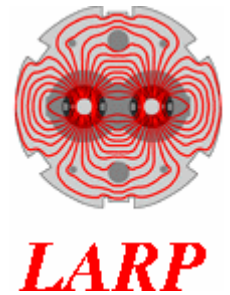
Introduction



- **Key players**
- **LHC Assumptions**
- **Scenarios**
- **LHC Requirements**
- **Joint Requirements**
- **Summary**



Key Players

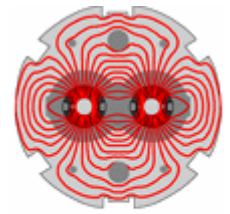


Key Players

- Suzanne Panacek (CD)
- Elvin Harms (AD)
- Mike Lamm (TD)
- Mike Lamont (CERN)
- Elliott McCrory (AD)
- Jean Slaughter (AD)
- Counsel from
 - Roberto Saban, Markus Albert, Guy Crockford (CERN)



Assumptions



LARP

For LHC

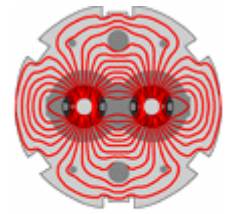
- Individuals working in a Field Control Room (FCR) in the LHC tunnel will have access to telephone communications with international calling capabilities.
- Individuals working at the CERN Control Centre (CCC) will have access to telephone communications with international calling capabilities.
- US/LARP personnel will be at CERN to coordinate activities between the CCC and LHC@FNAL.
- The degree to which LHC@FNAL users have access to the LHC control system will be determined by LHC management.
- The LHC will have a shift schedule and a protocol that defines the roles and responsibilities of CCC shift personnel.
- The LHC will have a protocol that defines how machine commissioning and development activities are scheduled and carried out.

For both CMS & LHC

- LHC@FNAL will comply with all CERN and Fermilab safety and security standards.



Scenarios



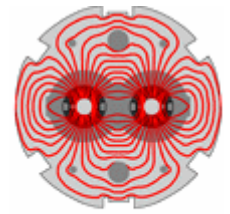
LARP

Six Scenarios conceived and discussed **Covered key aspects of LHC** **commissioning and operation**

- Hardware commissioning of a U.S./LARP deliverable
- Software contributions to LHC
- Beam studies from both CERN and U.S. perspectives (2)
- Diagnostics contributions to LHC via LARP
- First beam



LHC Requirements



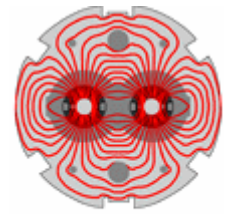
LARP

Four broad categories of Requirements – requirements scale up as scope of activity changes

- **‘Motherhood & Apple Pie’**
 - Confidentiality
 - space
- **Hardware Commissioning**
 - Access to data as U.S. hardware – magnets and instrumentation is installed and commissioned
 - Link to Field Control rooms in LHC tunnel
- **Beam Commissioning**
 - more activity in CCC
 - software development
 - Sector test
 - first beam
- **Post-LHC commissioning activities**
 - support of LARP deliverables
 - beam studies
 - LHC upgrades



LHC Requirements

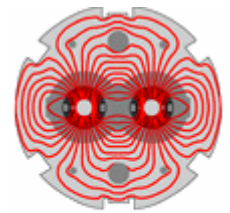


LARP





LHC Requirements



LARP

‘Motherhood & Apple pie’

Hardware Commissionin

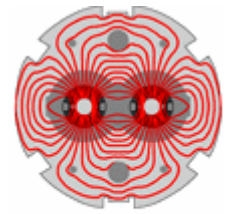
Beam Commissionin

post-activities

2 – 1. LHC Confidentiality	Essential	Proposed–EH
2 – 2. Enforcement of LHC Confidentiality	Essential	Proposed–SP
2 – 3. LHC Space	Essential	Proposed–PM
2 – 4. LHC Hardware Commissioning Data Access [126]	Essential	Proposed–MJL
2 – 5. LHC Hardware Commissioning Logbook [126]	Essential	Proposed–MJL
2 – 6. FCR Communications [126]	Essential	Proposed–MJL
2 – 7. FCR Shift Personnel [126]	Essential	Proposed–MJL
2 – 8. LHC Hardware Commissioning Timescale [126]	Essential	Proposed–MJL
2 – 9. LHC@FNAL Consoles [120] [138] [213]	Essential	Proposed–SP
2 – 10. LHC Data Access [128] [138] [178]	Essential	Proposed–EM
2 – 11. LHC Configuration Access [178]	Essential	Proposed–ML
2 – 12. LHC Daily Schedule Meetings [138] [213]	Essential	Proposed–EH
2 – 13. CCC Communications [120] [128] [138] [178] [213]	Essential	Proposed–EM
2 – 14. CCC Communications Channels [120]	Essential	Incomplete–SP
2 – 15. LHC Shift Personnel [128] [213]	Essential	Proposed–EM
2 – 16. CCC Software [120] [178]	Essential	Proposed–SP
2 – 17. CCC Software Maintenance [120]	Essential	Proposed–SP
2 – 18. CCC Console Layout [120]	Essential	Proposed–SP
2 – 19. LHC Development Environment [120] [178]	Essential	Proposed–SP
2 – 20. LHC Data for Testing [120]	Essential	Proposed–SP
2 – 21. Beam Study Proposals [128]	Essential	Proposed–EM
2 – 22. Beam Study Protocols [128]	Essential	Proposed–EM



LHC Requirement 2-13



LARP

5 scenarios referenced

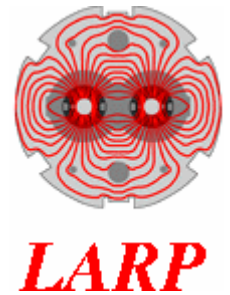
2 – 13. CCC Communications [120] [128] [138] [178] [213]	Essential	Proposed-EM
Several types of reliable 2-way communications shall exist between the CCC and LHC@FNAL. The types of communications shall include, but not be limited to: <ul style="list-style-type: none">• Telephone (wired and wireless)• On-demand video conferencing• Simple, prompt electronic messaging with audio alerts (for example, “instant messaging”)• E-mail• Electronic logbook		

for example, Scenario 138:

http://docdb.fnal.gov/CMS/DocDB/0001/000138/008/Scenario-Schottky_08.doc



CMS/LHC Requirements

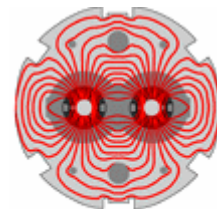


Two categories of Requirements

- **Common Capabilities**
- **Operational Environment**
 - Shift area – separate space for CMS and LHC
 - Common area – joint LHC/CMS work
 - Working area – not on shift, but access to capabilities



CMS/LHC Requirements



LARP

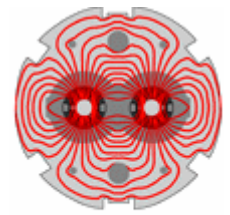
General Capabilities

3 – 1. LHC@FNAL Shifts [126] [213]	Essential	Proposed-EH
3 – 2. LHC@FNAL Record of Shift Schedule	Essential	Proposed-EG
3 – 3. LHC@FNAL Directory	Essential	Proposed-EG
3 – 4. LHC@FNAL Web Page	Essential	Proposed-EG
3 – 5. LHC@FNAL Lifespan [138]	Essential	Proposed-JS
3 – 6. LHC@FNAL Shift Area [213]	Essential	Proposed-EH
3 – 7. LHC@FNAL Common Area	Essential	Proposed-PM
3 – 8. LHC@FNAL Display Sharing	Essential	Proposed-EG
3 – 9. LHC@FNAL Working Area	Essential	Proposed-SK
3 – 10. LHC@FNAL Social Area	Essential	Proposed-EH
3 – 11. LHC@FNAL Clocks	Essential	Proposed-EG

Environmen



Joint Requirement 3-8

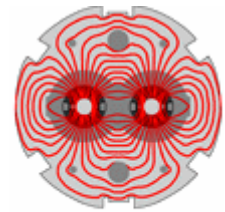


LARP

3 – 8. LHC@FNAL Display Sharing	Essential	Proposed-EG
To facilitate communication between CMS and LHC, LHC@FNAL consoles shall have the capability of displaying both CMS and LHC data.		



CMS/LHC Constraints



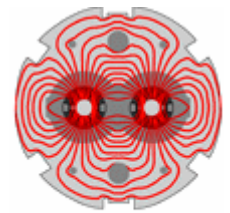
LARP

Restrictions to capabilities

- Presented together
- Work in progress



CMS/LHC Constraints

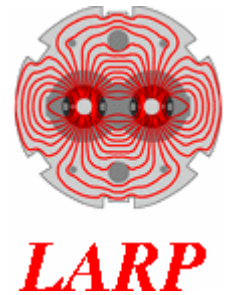


LARP

Communications	4 – 1. Communications	Essential	Incomplete-PM
	4 – 2. Computing	Essential	Incomplete-PM
	4 – 3. Reliable Networking	Essential	Incomplete-PM
Computing/Networking	4 – 4. Software compliance	Essential	Proposed-EG
	4 – 5. Software repository	Essential	Proposed-EG
	4 – 6. Version control	Essential	Proposed-EG
	4 – 7. Parameters database	Essential	Proposed-EG
	4 – 8. Software testing	Essential	Proposed-EG
Software	4 – 9. Computing and Networking Security	Essential	Incomplete-PM
	4 – 10. LHC@FNAL Space Security	Essential	Incomplete-PM
Security	4 – 11. General safety	Essential	Proposed-EG
	4 – 12. LHC@FNAL safety	Essential	Proposed-EG
Safety			



Summary



Preliminary LHC Requirements are spelled out based on scenarios of expected activities

- extracted from scenarios which attempt to anticipate all major events of the LHC's lifespan
- participation by LARP, CERN, FNAL potential active players
- end result is to mirror the CCC for accelerator activities
- provide for joint use by LHC/LARP and CMS